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SESSION 1936-1937.

AT A SPECIAL MEETING

Held at the Chartered Surveyors' Institution, Monday, 25th January, 1937.

Mr. J. M. THEOBALD (President) in the Chair.

The PRESIDENT said the Institution was honoured by the presence that evening of Colonel W. Garforth, of the Air Raid Precautions Department, who was going to lecture on a subject which was to the forefront at the present moment. The Council considered it to be of such importance that they had arranged a Special Meeting in order that the members might have an opportunity of listening to a lecture by Colonel Garforth on the subject.

The following lecture was then delivered:—

AIR RAID PRECAUTIONS:
Some Principles of Protection in Air Raids.

By Colonel W. Garforth, D.S.O., M.C.

1. THE AIR RAID PRECAUTIONS DEPARTMENT.

The Air Raid Precautions Department is a civil department and is part of the Home Office. For many years the

problems connected with the protection of the civil population against gas were considered by Sub-Committees of the Committee of Imperial Defence ; but the whole matter was treated as secret. In May, 1935, the Air Raid Precautions Department was formed, and took its place as part of the Home Office.

The head of the Department is Wing-Commander Hodsoll, and the address is Horseferry House, London, S.W.1.

The activities of the Department extend in many directions, and these include the passive protection of the entire civil population.

An air raid precautions organisation is being built up by local authorities. The Department is also in touch with factories throughout the country, and the managements of these organisations and of large business premises are being asked to prepare their own air raid precautions schemes so far as they are able. For this purpose, lectures on the principles of protection in air raids are being given to factories, business organisations and chambers of commerce.

2. Air Bombardment of the Future.

The air bombardment of the future would be very different to anything of a similar nature which took place in the last war. To illustrate this it may be mentioned that the speed of modern bombing aeroplanes varies from 180 to 300 miles an hour. Also, the weight of bombs which could be dropped in this country in one day in the next war might bear little relation to the amounts dropped in the last war.

Great advances have been made in the design of aeroplanes, instruments and the technique of bombing, and all these considerations make it imperative that attention should be paid to the question of protection against air raids.

We have good reason to be proud of the British Air

Force, which, in equipment, aeroplanes, pilots, instruments, and everything concerned with it, is second to none in the world. The numbers are down at the moment, but they are being rapidly made up. Should raiders unfortunately reach this country it should be realised that our Air Force is giving the enemy good measure in return in their own country.

I do not want in any way to alarm you in painting my picture. I only want to impress upon you the importance of taking precautions. If you take precautions, you will go a long way towards meeting the dangers of an air raid.

3. Bombs and Protection.

Before going into details of what a modern air bombardment will be like, one or two remarks regarding bombs may be of interest.

Bombs do not strike the ground at right angles. In other words, the angle of arrival is inclined to the vertical. This inclination in the case of bombs dropped from, say, 16,000 ft. is 16 degrees and from 2,000 ft. is 38 degrees. The height at which bombs can be released may vary from 20,000 ft. and over down to 1,000 ft. and under.

In an air bombardment three kinds of bombs can be used—the incendiary bomb, the gas bomb, and the high-explosive bomb. Each will be dealt with in turn.

The Incendiary Bomb.

The incendiary bomb may vary in weight from 1 kilo (*i.e.*, 2 lbs. 3 ozs.) up to 60 lbs. It is expected that the light kilo bomb will be more freely used than those of greater weight.

This bomb is a small magnesium cylinder, about 10 ins. long, filled with thermite or other such compound. When it hits a hard surface, such as a roof, the compound ignites, and that in turn ignites the outer case, which continues to burn for seven to ten minutes.

Experiments to determine the penetrative powers of the kilo bomb are now being undertaken, but it is known that this bomb will penetrate all forms of light roof, such as tiles, corrugated iron, slate, fibrous cement sheeting, glass, ruberoid, &c. Its penetration will, however, probably be arrested by the top floor of the building. Here the bomb would continue to burn for about ten minutes, and would set on fire any inflammable materials in the vicinity, such as furniture, bedding, curtains, &c. A reinforced concrete roof, 4 ft. to 6ft. thick, would probably, however, resist penetration by the kilo bomb, in which case the bomb would ignite on the surface of the concrete and then burn itself out.

As the bomb generates its own oxygen, it is not easily extinguished, and experiments are now being carried out to determine the best way of dealing with it. The cheapest and most readily available form of protection is to clear the attic or upper rooms of all inflammable material and to cover the floor with fine dry earth about 2 ins. thick. A greater quantity of material affords even more adequate protection, but it should be borne in mind that attic floors might not be strong enough to carry more than 2 ins. of this material. Similarly, sheet-iron (about 18 g.) or $\frac{5}{8}$-in. asbestos boarding (free from cement) can be used in place of the dry earth.

Although an incendiary bomb cannot be actually extinguished by sand, something may be done to control it by applying about 30 lbs. of this material with a long-handled shovel. By this action the glare is reduced, and the spread of the fire will be limited. Flames, however, will come out of the top of the sand. Chemical extinguishers, water, &c., can be used to limit the spread of fire. The water or chemical extinguisher should not be applied to the bomb itself but should be used to keep the surrounding woodwork wet. If the bomb has been partially controlled with earth, it can be picked up with a shovel and put in a bucket or other suitable container which already contains 2 ins. or 3 ins. of dry earth or sand. Further, earth or sand should

then be poured in the bucket before removing it from the building. In order to enable a person to approach the burning bomb, non-inflammable dark glasses are essential.

Gas Bombs or Spray.

The weight of a gas bomb will vary from a few pounds up to 250 lbs., and even more. The container weighs less than half of the total weight of the bomb.

Air Raid Precautions Hand-book No. 1 (Personal protection against gas), which can be obtained from H.M. Stationery Office, contains much information regarding gases which will be used in war. It is not necessary here to do more than mention that there are two main types of poison gas which might be used, namely:—

(1) Persistent ; (2) Non-persistent.

Persistent gases usually consist of liquids (*e.g.*, mustard gas) which contaminate the area on which they are released, and may continue to give off vapour for hours, days, or even weeks, if not neutralised.

Non-persistent gases, when released, rapidly mix with the atmosphere and disperse quickly.

These bombs are light metal cylinders containing gas. When they fall the cylinder opens and the gas comes out, generally in liquid form. It will lie about in wet weather for several days, possibly. In dry weather it will evaporate in five or six hours. A gas bomb, 50 lbs. in weight, will contaminate an area of about 800 square yards, though the whole of that area will not be badly contaminated. Food which has been exposed to gas vapour must be thrown away as it is not fit for consumption. On the other hand, water which has been exposed to gas vapour can be drunk if it is boiled ; it is then perfectly potable. Special precautions about food are being examined, and instructions on the subject will be issued in the near future.

Gas tends to lie low. If a gas bomb bursts in the street the clouds of gas will tend to enter cellars and other such

places. We have laid it down that 30 ft. above ground level the air is free from poisonous concentration of gas, but that figure is under investigation.

Making a shelter gas-tight is simply a matter of common-sense. It is a question of keeping the air outside, which may be laden with poison gas, from coming in, sealing up all windows and floor-boards that may be cracked, and blocking up fireplaces, ventilators and so forth.

As regards respirators, there are three types—the Service respirator, the civilian duty respirator and the general civilian respirator.

The Service respirator, which is the type used by the defence services, will be used by those who must enter and remain in heavy concentrations of gas, such as policemen, firemen and members of decontamination squads.

The civilian duty respirator is intended to afford protection to persons who have to carry on their normal duties in the presence of poison gas, but who are not likely to be exposed to such high concentrations as the defence services, police, &c.

A specification for this respirator has been prepared in the Department, and is available for any firm that cares to apply for it. The firm can then make a sample respirator, and if that respirator passes the Government test, the firm is allowed to use the Government certification mark.

The general civilian respirator is intended for use by members of the general public. It will be made in Government factories and issued to everybody in the country. It will be issued free to everyone.

Special arrangements, which will be published in due course, are being made for small children.

I received a letter the other day from an anxious lady asking whether we had respirators for her Orpington chickens. We have not arrived at that stage yet, but animals, such as horses and dogs, are being considered.

All the above respirators are designed to protect the

wearer's eyes, face and lungs from any known poison gas which may be used in warfare.

There are worse gases known, such as carbon monoxide, but they cannot be used for military purposes, because they do not possess the necessary factors. If you hear anyone making the statement that these respirators are not proof against every known military poison gas, I hope you will contradict it. Would any civilised Government dare to issue to its people a respirator which was not so proof? To prove to you that what I say is true, I should be quite prepared to go with my wife into a chamber containing 100 times greater concentration of poison gas than you are likely to meet with in war, and to ask you to accompany me with your wives. If we had our respirators on we should not suffer any harm.

High-explosive Bombs.

High-explosive bombs carried by aircraft weigh anything up to 3,000 lbs. each. A bombing aeroplane can carry from two to three tons of bombs. Owing to the great expense of the heavier type of bombs, such as those weighing 1,000 lbs. and over, it is unlikely that these will be used except against special targets, such as arsenals, dockyards, railways, &c. Those weighing under 1,000 lbs. will, however, be quite common, and the effect of these bombs may be classified under two heads, namely, fragmentation and blast.

Fragmentation is the breaking up of the shell of the bomb into small pieces, which inflict damage to material and personnel in the vicinity.

Blast is the sudden creation of high air pressure designed to shatter buildings, machinery, &c., which may be exposed to it. The effect of blast dissipates rapidly, but in the case of heavy high-explosive bombs bursting, say, less than 50 ft. away from a building, the effects of blast may be considerable. Most buildings would probably suffer severely.

High-explosive bombs may be of two kinds: (i.) those

intended to explode on contact with a hard surface, in which case they are fitted with percussion fuses ; and (ii.) those intended to penetrate deeply into the ground or into a building, in which case the bomb is specially strengthened and fitted with a semi-armour piercing nose.

A 500-lb. bomb fitted with a percussion fuse, when falling on a large multi-storeyed building, would detonate on the roof, or certainly on the top floor, bringing down a considerable part of the building with it. Medium and heavy bombs fitted with a semi-armour piercing nose would penetrate right through such a building down to the basement before detonating, when a great deal of damage would be done.

Protection from high-explosive bombs fitted with percussion fuses would be afforded by highly reinforced concrete about 5 ft. in thickness, but the semi-armour piercing bomb must also be considered.

Protection from 500-lb. high-explosive bombs fitted with semi-armour piercing noses can only be secured by constructing shelters at considerable depths below ground level, say 50 ft. to 70 ft., or by protecting the shelter or basement by an independent mass of concrete, highly reinforced, from 12 ft. to 15 ft. thick. As both these forms of protection are very costly it will, as a rule, not be possible to provide protection against direct hits of medium and heavy semi-armour piercing high-explosive bombs. In exceptional cases, however, such as vaults for banks or other special buildings, such protection may not be out of the question.

Efficient protection can, nevertheless, be provided against the effects of blast and splinters from the explosion of high-explosive bombs. Good protection can be afforded in cellars or basements or specially constructed underground shelters. In the absence of this form of protection, shelter can be obtained on any floor of a building provided the shelter is made gas-tight ; and, in the case of ground floors, sandbag walls (or sand or earth between shuttering) across the window and door openings can be provided to prevent the ingress of splinters.

When a concrete shelter is built in the garden the roof must be strong enough to resist the light incendiary bomb, and we recommend that it should be strong enough to resist the 25-lb. high-explosive bomb, for which purpose 22 ins. of reinforced concrete are required.

Thickness of Materials to resist pentration.

The following thicknesses of various materials will resist pentration by splinters from a 500-lb. bomb exploded at a distance not nearer than 50 ft. away from the materials named:—Mill steel plate, 1½ ins. (special steels may give increased resistance) ; stock bricks in cement mortar, 13½ ins. solid and 15½ ins. hollow (with 2-in. cavity) ; ordinary concrete not weaker than 6—1 mixture, 1 ft. 3 ins.; reinforced concrete, 12 ins. (normal structural reinforcement) ; reinforced concrete, 10 ins. (specially reinforced to resist the punching sheer effect of the splinters); sand or earth, 2 ft. 6 ins.; shingle or ballast, 2 ft.; shingle contained between steel plates, front plate ¼ in. thick, back plate ½ in. thick, 10 ins.; coal (lump or dust), 2 ft. 6 ins.; brickbats, 2 ft.

Trenches.

If suitable protection for personnel cannot be found in a building, excellent protection can be obtained in shelter trenches 7 ft. deep with passage-ways 2 ft. wide. Recesses suitable for the accommodation of, say, ten men seated are cut off these passage-ways. The trenches should, of course, be revetted. Various forms of revetment can be used, such as boarding, corrugated iron or other suitable materials. The trench can be made gas-proof by covering it with 2 ft. of earth supported on corrugated iron. If rubble is available, a layer of 9 ins. of this material should be placed on top of the earth. Where revetment is used, the excavated width of the passage-way should be 2 ft. 10 ins.

An air lock should be provided in the passage-way at each entrance. This may take the form of two gas curtains 4 ft.

apart with a shelf at the side of the trench on which the curtains are placed when not in use.

A diagram of a trench system for accommodating several hundred people is shown in A.R.P. Handbook No. 6.

Similarly notes on the construction of mined galleries are supplied by the Department.

Shelters and Gas-tight Rooms.

Information regarding the making of a room gas-tight is given in the Handbook for Factories, which is on sale at H.M. Stationery Office.

The same principles apply to making large basements, &c., gas-tight.

As regards shelters in general, certain points should be borne in mind. These include a supply of water independent of the normal water supply mains (which may, of course, be damaged), an independent lighting system, sanitary arrangements, a supply of food and self-contained wireless.

Further notes on this subject can be obtained by application to the Department.

As regards the selection of cellars or basements as shelters, it is most important to bear in mind the possibility of flooding. In the case of cities where high-pressure mains (which may be damaged by high-explosive bombs) exist close to cellars or basements, this danger of flooding is very real, and unless it is quite certain that there is no possibility of flooding in this way, cellars or basements should be avoided as shelters. This is a point which may easily be overlooked and which demands special attention.

In the case of newly constructed shelters, the ceiling should be designed to carry the weight of débris resulting from the demolition by high-explosive bombs of, say, part of the building above it. For this purpose it is estimated that the floor should be strong enough to carry a super-

incumbent weight of 4 cwts. per foot super. The unsupported span of floors over the shelter (which form the roof of the shelter) should not exceed 15 ft. to 20 ft.

Ventilation of Shelters.

In the case of a small house, with a cellar holding ten people, artificial ventilation is not required. If you add together the area of the walls, the ceiling and the floor, and divide the figure obtained by 75 sq. ft., that will give you the number of people who can occupy the shelter for six hours while the shelter is hermetically sealed. If you divide the figure by 100 sq. ft., you get the number who can occupy the shelter for twelve hours. That is a very simple rough rule for your guidance, but do not forget that that refers only to small shelters containing about ten people. With a larger number of people mechanical in-put ventilation or regenerative ventilation is required. By the former method air is drawn into the shelter through a gas filter, and by the latter method the air in the shelter is regenerated by the abstraction of carbon dioxide and the supply of oxygen. I was sent to Paris about two months ago, and I found that both those systems of ventilation were installed in all the shelters there. The regenerative system is worked by its own generating plant, which also supplies the lighting.

Windows of Shelters.

You may not be able to prevent splinters coming in through the windows in the higher storeys of a building, but you can prevent the windows being broken by blast. If you stick celluloid 1/64 in. thick on the inside of the window-panes, they will not be shattered into little bits. Alternatively, if you substitute for the glass vitreo-colloid 1/10 in. thick (it is a gelatinous substance, like old touring car windows, and can be bent), and if you put ½-in. wire netting immediately behind it, that will stand up to blast and will not break, and therefore the room will remain

gas-tight. If several thicknesses of ordinary cellophane, such as is used on packets of cigarettes, are stuck on the inside of window-panes, it will have the same effect as the 1/64-in. celluloid ; the windows will not be shattered and the little bits hurled about the room.

Supposing the windows do get broken, if you have a frame with two thicknesses of blanket fixed in it and with ½-in. wire netting on both sides of the blanket, that can be put into the window-frame and it will stand up to blast and keep the room gas-tight.

Dispersion.

In cases where it is not possible to find protection in buildings or specially designed shelters, and where open ground is not available for trenches, the operatives of large factories and business premises may be dispersed to their homes. This, however, must be done within the warning period.

4. Warning of Raid.

The country has been divided into areas, and when the raiders reach a certain distance from any particular area that area is warned. With the great speed at which modern aircraft travel it will be unwise to count on receiving more than seven to ten minutes' warning.

5. Protection of Material.

Buildings such as power-houses, first-aid posts, hospitals, telephone exchanges and other buildings of vital importance will require special protection. This may be given in the form of sandbag walling across doors and windows and, in some cases, along the walls, &c.

In the case of large factory buildings the question of protection of machinery has been considered. Sandbag traverses or traverses consisting of other materials such as bricks, shingle, &c., can be constructed for this purpose.

Steel netting has even been suggested as a means of protection against splinters, but experiments have shown that this method of protection is unsatisfactory and is also very costly.

6. Lighting Arrangements.

All buildings should be provided with means of preventing lights being seen from the outside. This may be effected, of course, by means of carefully fitting blinds.

7. Camouflage.

A few remarks about camouflage may be of interest. The object of camouflage is to disguise an object. In the War it will be remembered that whole battery positions were covered by scrim netting, which, from the air, made the position appear as open fields, and while a certain amount can be done to make it more difficult for the enemy pilot to pick up his target, the shadows cast by vertical walls, &c., are the main difficulty to contend with. Tanks and gasometers can be rendered less conspicuous by painting the tops the same colour as that of the surroundings, with the sides painted a similar colour, only a lighter shade. In addition, grey streaks can be painted across the roof and down the sides to simulate roads, and the outline of the tank or gasometer can be broken up by patches of black or other colour. In the original lay-out of a factory something can be done by avoiding straight roads, judicious planting of trees, and avoiding shiny surfaces as far as possible.

The main object to bear in mind is that if anything can be done to make it more difficult for a raider to pick up his target, something has been achieved.

8. Smoke.

The question of smoke is receiving careful consideration by the Department. If a smoke cloud is formed to conceal

a target, it should cover roughly nine times the area of the target in question.

Although smoke clouds to cover targets of any considerable area are therefore costly to maintain, the matter is receiving careful investigation, as it is considered that in certain cases smoke will be useful in making it more difficult for the enemy to recognise and pick out his target.

10. Books being prepared by the Air Raid Precautions Department.

Books and memoranda on the subject of Air Raid Precautions have been, or are being, prepared by the Department.

A.R.P. Handbook No. 1 (Personal Protection against Gas) and Handbook No. 2 (First Aid for Air Raid Casualties) can be obtained from H.M. Stationery Office.

A.R.P. Handbook No. 6 (Factories) is also available from H.M. Stationery Office. This book explains how the managers of factories and large business premises can prepare their own air raid precaution schemes.

A very important book, namely, Handbook No. 5 (Structural Precautions against Bombs and Gas) is now under preparation. This book will be of a technical nature and will afford detailed guidance to architects, engineers, local authorities and others on certain of the matters referred to in these notes—*e.g.*, the construction and adaptation of shelters and the protection of buildings of different kinds.

In the meantime the Department will be pleased to give to those dealing with new structures any assistance it can with the knowledge it has up to date, and to make suggestions on the design with a view to incorporating structural precautions against air raids.

Such structural precautions may include a concrete roof to keep out light incendiary bombs, the use of fire-resisting materials in buildings, the roofs of shelters to be strong enough to take the weight of falling débris, *i.e.*, calculated

to stand a weight of 4 cwts. per foot super, framed structures (steel or reinforced concrete) preferable to the old solid type of structure, and the use of non-absorbent building materials where there is danger of contamination by liquid gas.

The sills of windows should be made high so as to prevent splinters coming through the window opening and hitting people inside the room. It is better to have a number of small windows than a few large windows. Heavy water tanks high up in a building should be carefully braced to the main structure.

11. The Preparation of Air Raid Precaution Schemes.

All managers of factories and business premises employing over, say, 100 operatives are urged to prepare their own air raid precaution schemes. Notes giving the suggested headings for such schemes are obtainable from the Department.

I was recently asked to meet the committee of one of the large London banks to help them with their scheme, and I found that they had got our handbooks and had prepared a very satisfactory scheme.

Beyond the preparation of a carefully thought-out paper scheme, which can be readily put into operation without delay should an emergency arise, no further action is now suggested. Arrangements should, however, be made for the supply without delay of the necessary materials—tools, sandbags, earth, &c.—if and when required.

While it is hoped that the necessity for putting such a scheme into operation will never occur, it is incumbent on all in authority to prepare one.

The preparation of an Air Raid Precaution Scheme does not mean the inevitability of an air raid any more than the taking out of a fire insurance means the inevitability of a fire.

Furthermore, it is hoped that architects will give the question of structural precautions their careful thought and

consideration, as the safety of many thousands of their countrymen may depend on their labours in this direction.

12. Assistance of the Air Raid Precautions Department.

Finally, it may be stated that the Air Raid Precautions Department is always at the disposal of anybody who may require its advice and assistance.

It was apparent from the keen discussion that followed that Colonel Garforth's lecture evoked great interest, and the opportunity was taken by many at the meeting of asking the lecturer questions of personal and professional interest on the various aspects of the subjects dealt with.

Replying to questions raised in the discussion Colonel Garforth said the agencies through which the public would be taught the use of gas masks were the British Red Cross and St. John's Ambulance Association, and if application was made to a local authority he had no doubt that the necessary instruction would be given.

As soon as the storage depôts for respirators were in being, the general public would be invited to go to those depôts and try on gas masks. The respirators to be issued were proof against every known military poison gas as far as the eyes and lungs were concerned.

The actual liquid from a gas such as mustard gas would in time soak through clothing and would cause blisters on coming into contact with the skin, so that obviously a respirator would not give full protection if liquid gas actually splashed on to the person. Special protective clothing was necessary in such a case. On the other hand, if people obeyed the Government request and stayed in doors in an air raid, the chance of getting the gas splashed on to them in liquid form was remote.

The method of distribution of the gas masks was being worked out very carefully, and he could give an assurance that everybody would be in possession of a gas mask in time to meet an emergency. They would be issued before hostilities started—possibly some days before.

With regard to the question of ventilation in shelters and the position of gas filters, they must be specially protected, and the safest place was in the shelter itself. The air drawn in must pass through the gas filter before being discharged into the shelter, and the air intake should be as high as possible. This would enable air, which was as free from gas as possible, to pass through the filter. The gas filter would then have a longer life, as it only broke down from the effect of poison gas and did not deteriorate from the passing of pure air. The duct from the air inlet should also be protected, and should, if possible, be inside the building.

It had been laid down that at a height of 30 ft. the air was clear of gas, but there was a certain amount of risk in relying on that figure, and, as he had said, it was now under re-investigation. Therefore, in the case of mechanical input ventilation, he recommended that gas filters should be put at ground level, near the point where the duct entered the shelter itself.

The general civilian gas mask was not designed for people to wear who remained for a long time in a poison gas area. It was designed for people to wear who were seeking shelter or passing from one shelter to another. Therefore a man should not remain out with a general civilian gas mask on, but should seek shelter as soon as possible. It was better to be in a gas-tight room because the fumes of the gas, if one was long enough in a high concentration of gas, might affect one's skin.

Local authorities in the country were interesting themselves in the matter of providing precaution from air raids in the large residential areas and the big cities. The engineers in the Department dealt with architects, surveyors, individual inquirers, business and commercial people, chambers of commerce, and so forth, but there were special officers in the Department to deal with local authorities. The large majority of local authorities were very actively engaged in building up air raid precaution organisations to consider all the questions in connection with the matter.

On the question of water supply being affected by gas bombs, Colonel GARFORTH outlined the position as follows:—

Pollution may be caused by liquid gases such as mustard gas and lewisite, or by gases producing arsenical smokes. The filter beds of a reservoir will deal adequately with mustard gas. They will also deal with lewisite, except for a small quantity of arsenic which the gas forms in solution. This quantity of arsenic is so small that it would require a very heavy concentration to do any harm, and in the case of an ordinary large reservoir the chances of this happening are almost negligible. There remains, therefore, only the danger from arsenic from the arsenical smoke gases. This is a theoretical rather than a practical danger, as it would

require a large number of such bombs to produce arsenic in sufficient quantity to be dangerous.

The case of the service reservoir, which is of smaller size and which is without subsequent filter beds, is somewhat different. In this case the target is relatively small, so chances of serious contamination are remote. Mustard gas will sink to the bottom below the level of the outlet, except for very small particles. These are destroyed by hydrolysis, and even if some of these small particles escape through the outlet they would be destroyed in the water mains before reaching the consumer. If a bomb containing lewisite or arsenical smokes fell into a service reservoir (the chances of this are very remote) the water should be tested for arsenic and, if necessary, cleansed chemically.

As far as training the public to know when the danger from gas was over, a civilian gas school had been established near Bristol and another one would shortly be established in the North. At the school near Bristol representatives from local authorities were being trained, and very large numbers had been trained already. Members of the police force and fire brigades and other representatives of local authorities were going through various courses. Under the local authorities there would be very efficient organisations. In addition to the first-aid posts, there would be gas detectors and street wardens, and people in dug-outs, cellars, basements, and so on, would be informed when it was safe for them to come out into the street. There was a detector paint which changed colour when it was in contact with liquid gas.

Colonel GARFORTH said that he was fully alive to the danger of the grid system being damaged in an air raid, and that this important matter had received for months past the very careful consideration of all the responsible authorities, and every precaution was being taken to meet that danger.

He was often asked about panic, and it might interest the meeting to know that a short time ago he had spoken about that subject to the general manager of a factory on the banks of the Thames, who had been there all through the last War and whose factory had been subjected to heavy air raids. He had had 500 young girls under him and he had never had a single case of panic, because those girls knew what to do. English people did not panic, and if they knew what to do and what precautions to take there was no panic ; it did not come into the picture at all. That was why it was so important that people should know what to do and what precautions to take. For instance, he thought it was probable that before the members came to the meeting that evening they thought that gas was the greatest danger in an air raid. He hoped he had dispelled that idea.

Fire was the greatest danger in an air raid. If people knew what to do about gas, how to put on their respirators, how to take shelter, how to prepare their gas-tight rooms, and so forth, they had nothing to worry about. In proof of that he might say that the casualties in the British army from gas in the latter part of the last War, when everyone in the Army had his proper respirator, were only about 2 per cent. As he had said, if people knew what to do, there was no need to worry about gas ; but if they did not know what to do, it was a very dangerous thing indeed.

On the question that surveyors should take any particular action at the moment with regard to allocating for gas-proof chambers a portion of the space in various buildings in which they were interested and doing constructional work now, or limit their activities to new buildings, including residences of various kinds, as well as business premises, Colonel GARFORTH said that his Department wanted the owners of existing houses, offices, factories, and so on, to adapt their basements in accordance with the instructions given in the hand-books to which he had referred, and it was also most important that the various provisions mentioned should be incorporated in any new structures. It was therefore desirable that surveyors should be very active in the matter.

Frame structures, Colonel GARFORTH maintained, were better than brick or stone structures in the case of air raids. He had been employed on the reconstruction of Dharmsala, a cantonment in India which suffered very severely from the earthquake of 1905, and box construction had been employed there. Steel framework was used, the panels being filled in with light bricks, and so forth, or, alternatively, wooden framework was used. A frame building was better in an earthquake, and it was also better in an air raid. The panels might be blown out, but the main fabric remained standing, whereas in the case of a solid type of building the whole thing might collapse.

In the matter of deciding what public buildings, particularly underground buildings, would be available for shelter in the case of an air raid, each local authority was dealing with that as it thought best. The Department did not recommend any particular building ; it was left to the local authorities to choose the buildings, and they were doing it quite well.

The policy as regards the tube railways had not yet been published, but he would go so far as to say that it was not likely that the tubes would be available as public shelters as they would be required for transport. There was no need to worry about that, however, because provision would be made in other ways. But before an emergency arose, the Government's order with regard to railways would be made known to the public. He was sorry

he could not be definite about it, but all he could say at the moment was that it was unlikely that the tube railways would be available for use as shelters.

The PRESIDENT, on behalf of all present, heartily thanked Colonel Garforth for his most instructive lecture, and conveyed to him the appreciation of the Institution of the very important work that was being carried out by his Department.

AT THE ORDINARY GENERAL MEETING

Held at the Chartered Surveyors' Institution, Monday, 8th February, 1937.

Mr. J. M. THEOBALD (President) in the Chair.

NEW MEMBERS.

The following new members were received by the PRESIDENT prior to the meeting and signed the Register:—

Professional Associates :

CLARKE, ARTHUR WILLIAM
CURRIE, PATERSON MORTON DUNLOP
DOWNING, GILBERT LAXTON
LAVENDER, JOHN SWINFEN

HONORARY MEMBER.

In recognition of his impending appointment as the first Chief Justice of India, Sir Maurice Gwyer, K.C.B., K.C.S.I., K.C., was transferred from the class of Associate to that of Honorary Member.

A DISCUSSION took place on Major R. Ll. Brown's Paper entitled

REVISION OF ORDNANCE SURVEY 25-INCH PLANS FROM AIR PHOTOGRAPHS.

Major R. Ll. Brown, R.E., in presenting his paper, showed a number of lantern slides to illustrate the points brought out therein and acknowledged his indebtedness to those who had lent him lantern slides—the War Office and the Air Ministry, Messrs. Ilford (who had lent him some very good slides made from infra-red photographs), and Messrs. Aerofilms, Ltd.

Mr. Geoffrey L. Vigers (Member of Council), in proposing a vote of thanks to Major Brown for the trouble he had taken in preparing and presenting his paper, said that it dealt with a subject of the deepest possible interest to all surveyors.

The fact that the Ordnance Survey was not up to date had nothing whatever to do with the Ordnance Survey Department, and no body of men appreciated more what the Ordnance Survey Department had done in the past and was doing to-day than the Surveyors' Institution. He could say without fear of contradiction that no body had done more than the Institution in endeavouring to get the necessary financial provision made in order that the Ordnance Survey of this country should be brought up to date, and now that there was a possible opportunity of getting the Ordnance Survey revised more expeditiously than would otherwise be possible, all the members of the Institution were extremely interested in the possibilities of Ordnance Survey and other survey revision by means of aerial photography. The Institution as a body was interested merely in seeing what could be done by various means for survey purposes ; it was not interested in the very least in the question of who did the work. Some people had expressed views from time to time as to how the work should be done, but as far as the Institution was concerned, it had no official views beyond the fact that it desired to see the Ordnance Survey revised at the earliest possible moment.

He entirely agreed with what Major Brown had said with regard to the question of co-operation between the ground surveyor and the man who worked from the air. The air survey was only

another means of assisting the ground surveyor to do his work efficiently and to complete it satisfactorily, and those people who thought that the arrival of air survey would mean the passing of the ground surveyor made a very great mistake.

Major Brown had spoken of the fickle nature of the climate of this country, and those who had had practical experience of that knew only too well that it had been impossible during the last two years adequately to test out the means of air survey in this country.

He was of the opinion that the photographer must be a separate individual from the pilot. The photographer's task was to attend to his particular part of the operation of air photography for survey purposes, and the pilot must attend to his particular task the whole time.

With regard to the question of the old errors in plans, it was extraordinary to find how an error could be perpetuated over a very long period. The company in which he was interested had been engaged for some time in making surveys for railway companies of their properties and the routes of their railways, and the company had found—and had been able to satisfy the railway companies on the point—that plans which the railway companies had been using for years were in fact inaccurate. But for the air photographs the companies would never have admitted that it was possible for their standard plans to be wrong.

When one came to the modern proposals for laying out land, such as had been shown by Major Brown on the screen, the necessity of air photography would become even greater than if people still designed and laid out their estates and built their houses in squares and rectangles and were not subject to the views and the outlook and the general experience of town planners.

His duty was to propose a very cordial vote of thanks to Major Brown, not only for his paper and for the photographs he had shown upon the screen, but also for sparing the time, fully occupied as he was in the revision of the Ordnance Survey in this country, to come to the meeting that evening and give the members of the Institution some instruction on a subject in which they were deeply interested.

Sir Charles Bressey, c.b. (Member of Council), said that he approached the matter perhaps from a more oblique angle than Mr. Vigers, but it gave him the greatest pleasure to second the vote of thanks to Major Brown for his extremely interesting paper. His interest in aerial surveying arose from his association with road construction, in which connection he might say that his friend General Winterbotham had rebuked his Department for having

done more than any other to make the Ordnance Survey out of date! An attempt had been made to remedy that by making use of the very rapid means of record photography, and he suspected that he was one of the first to attempt to use it on any large scale for the record of country which it was desired to traverse with a road. Immediately after the War, when it was desired to construct the London-Southend road as an unemployment scheme, he had endeavoured to obtain a complete aerial strip photograph of that stretch of thirty or forty miles, and the improvement which had since been effected was shown by the fact that in those days it was impossible for those who were working for him to obtain a complete photograph. They worked at it for months, but ultimately, before it could be exhibited to the Minister, several patches of it, where obscured by ground mist, had to be faked by hand.

More recently, through Aerofilms, Ltd., he had had most excellent and accurate records made of certain areas in which he was particularly interested in connection with the highway development of Greater London, and he had found that aerial photography had many merits apart from its purely scientific and topographical merits. One was its comparative secrecy.

Again, not only were the surveys extremely accurate, but he had found that a mounted mosaic photograph of a strip of country was more attractive to a committee, composed partly of non-technical men, than any other form of representation. The aerial photograph appealed to the public so convincingly that if he had to put a controversial scheme before a Parliamentary Committee he would rather produce a photograph than a plan as a means of arousing sympathetic interest.

The aerial survey was extraordinarily useful as a record of floods. When the floods were out it was difficult for land surveyors to take a satisfactory record of the area submerged, but on a clear day there was no difficulty in aeroplanes going up and collecting incontrovertible evidence. He wished that many local authorities would obtain records of that sort for public display, so that people who wished to buy houses might inspect those photographs before acquiring a home on land which was doomed to be submerged when the next flood came. He had reason to believe that in one county at any rate it was proposed to take records of that kind.

He concluded by most heartily seconding the vote of thanks.

Mr. W. R. Brackett (Professional Associate Member of Council) (representing the Junior Organisation) said it gave him very great pleasure to have the opportunity, on behalf of all the junior members, both those who were present and those who would read the paper in the *Journal*, of thanking Major Brown

for his extraordinarily fine and learned paper, and for the charming embellishment of it, both personally and with photographs, that he had given that evening.

He was very glad that reference had been made to the use of vertical photographs. Whilst at first blush they looked less informative than the obliques (and they were certainly less picturesque), yet he felt certain that there would be an enormous scope for their use in the future. By themselves they were informative, but they were particularly informative when seen in pairs stereoscopically ; they then showed detail of all kinds in a way which nobody would expect from seeing merely the single photographs which the author had shown that evening. One could tell the difference between a lean-to and a pitched roof and between a single storey and a double-storey building in really striking detail. He was certain that, if it was made possible, through some organisation or other, for the photographs to be available to the surveying public, and surveyors applied themselves to the task of learning the art of interpreting the photographs, they would have an extremely valuable new instrument in their hands. As mere surveyors, as distinct from Ordnance surveyors in the higher grades, the members were possibly less interested in the means of production of the Ordnance Survey plans than in the plans themselves when those plans came into their hands, and they were, of course, only too well aware how desperately out of date many of the plans were, through no fault whatsoever of the Ordnance Survey Department but simply through retrenchments made upon their finances. Surveyors were all crying aloud for new plans, perhaps not very vociferously as a body, although the Institution did a great deal in that direction two or three years ago. While the rate of production had been increased, he believed that the Department was very far indeed from overtaking the arrears in a reasonable time, and he supposed it was true to say that there were very few large towns in England where the Ordnance sheets, especially of the suburban areas, were of any real use. The Ordnance Survey Department was getting on with the work to the highest possible standards of accuracy in such a way as to be almost constituting a re-survey, and it seemed a pity that there was no organisation to supply revised maps to the general surveying public to a slightly lower standard of accuracy. By that he did not mean slipshod work ; he meant not the making of a nation-wide survey, but the filling in piecemeal from accurately rectified photographs on to old sheets with suitable ground control. That was work which he knew Messrs. Aerofilms had done in a great many cases. Unfortunately their work could not become available to the ordinary surveyor. The trouble was entirely one of cost. Taking a fairly

large town with about a quarter of a million inhabitants and an area of about 15,000 to 17,000 acres, and supposing that since the last survey about 25,000 alterations (which Major Brown so kindly called " improvements " in his paper) had been made, the whole area could be surveyed for the comparatively small sum of 8*d*. an acre, and that would no doubt be reduced still further with the wider use and further development of automatic pilots, faster emulsions and improvements in technique generally. Therefore, for the area he had taken, the cost would be just over £500, which would not mean very much per sheet if a considerable number of people took them. It was the revision of the plans which cost rather a large amount of money—some £2,500 in the case he had taken—so that there was a considerable aggregate cost. If one got together a number of professional people who would take, say, ten sets, and one got the local authority to take some ten sets for their various departments, that would be about twenty sets in all, and that would bring the cost down to about £5 a sheet, of which about £1 a sheet would be for actual flying work. Of course £5 a sheet was too much, the reason for that cost being that he was assuming that only twenty sets were sold, whilst further sets would cost very little more to produce. The difficulty was that Messrs. Aerofilms, Ltd., were not financially constituted to do the work of a large-scale map shop. Their work was flying and revising, and their capital was fully employed in that work. It seemed a great pity that local authorities were not taking the opportunity of co-operating with private individuals to secure revision work. In many cases in which local authorities had revised their plans, so far from co-operating they were actually withholding the plans from their own ratepayers, and he thought it was a very great pity that there was no co-operative organisation. He only hoped that one would be developed in the meantime, to serve as a useful temporary stop-gap until the Ordnance Survey had completed its fine and high-grade work.

He wished to thank Major Brown, on behalf of all the junior members of the Institution, for his most lucid and instructive paper.

Brigadier H. St. J. L. Winterbotham, C.B., C.M.G., D.S.O. (Honorary Member), said there were a few points in Major Brown's admirable paper to which he wished to refer. They were all concerned with visibility, because one could photograph from above, but one could not photograph what the camera could not see. It was quite true that surveying from air photographs had an air of romance, but one had to examine it fairly carefully. A photo-

graph gave one a roof plan, so that in many instances one did not get those underneath passages and areas underneath overhanging balconies which must be shown on plans which were not roof plans but ground plans. Major Brown had rightly spoken about the "roots of the hedges." Every surveyor knew how important were the roots of a hedge if he wanted to use an Ordnance Survey plan. Major Brown had also said that in recent times that point had not been much trouble. That was principally, he thought, because Devon, Somerset and Cornwall had been revised only about four years ago. In those parts one very often found a hedge which was 8 to 10 ft. broad ; that in itself was not so bad if the roots of the hedge were immediately under the centre, but the roots of the hedge were nearest the side of the more industrious farmer, and it would often be found that they were almost at one edge. Then, again, there were such things as wire fences, and the air photograph would not show a wire fence—at any rate it did not in the days when he was active, though possibly the clearer definitions of to-day might bring it out.

He thought it was obvious to all people who understood anything about geometrical optics, from almost the first day that the photographs were obtained, that they offered a possibility of doing surveys of practically any class of accuracy which was required, but at a price. Every method was at a price. The question, therefore, for a man who administered national funds and was prosecuting national business was how much of that particular method he could afford to use. Very few people in England realised how extraordinarily small were the costs of survey organised on mass production lines. It would, he thought, astonish many people present that evening to know that the survey of England at 25 ins. to the mile cost on the average one shilling an acre, and that included the cost of publishing the plans. It was also a remarkable fact that the revision of a plan in country areas used to cost a penny an acre. Those figures were, of course, too small to-day. But between the mean epoch of those figures, which was round about 1880, and to-day one could multiply by that factor which was known to represent the difference between prices then and prices to-day. It was with figures such as those that the air photograph had to compete, and the net result was that it could not compete everywhere, but it would very handsomely compete where the subject was suitable for it.

A very interesting point had been made that evening about flood lines, and he was entirely in agreement with what had been said. He had seen aerial photography used with the greatest practical advantage to define the flood waters of the Upper Zambesi. Nothing in the world could do it as well as the photograph, because

the photograph could take its record at any given moment and cover a very large ground ; but in England, of course, there was again the grave disadvantage of the climate. The main point, he thought, was to prosecute research upon the speed of emulsions suitable for infra-red photography. The trouble with infra-red work was, of course, that it shut out so much light that exposures had to be very much longer, and therefore the exposure became impossible for a rapidly moving camera. He believed that very great advances had been made in recent times in increasing the speed, but it would be necessary to get down to something of the order of 1/100 second before it became really applicable.

It had been mentioned that evening that air photographs were a useful tool in the hands of the surveyor who was thinking in terms of estates and not of counties. That was a very sound point to make, because any distortions lost their effect very rapidly as one narrowed down the area concerned.

Mr. W. H. Scanlan (Fellow) expressed his appreciation of the paper, which appealed to him particularly by reason of the fact that during the War he had been an observer in the Air Force engaged in taking photographs. The slides which Major Brown had shown indicated the great improvement which had been made in air photography, and he could imagine the value that the present-day photographs would have been during the War.

The subject of the making of maps took him back to the War, to an occasion in 1917 when at a certain point on the French front he and those with him had been supplied with maps which were out of date, and they could not find landmarks where they were supposed to be. They had air photographs taken, and even then could not locate on the maps certain positions, so they marked certain points on the photographs and with the aid of gunfire from various angles endeavoured to fix an exact position on the maps. Having done that with the air of special field-glasses and triangulations, they were enabled to plot squares on the photographs to conform with those on the maps. In that way they started to fill in details of the country which they could check from observation balloons and aeroplanes.

It was a very long task, and very often they said some unpleasant things about the aeroplane pilot and his angle of tilt, to which Major Brown had referred, which often gave a very distorted view of the country.

Another point mentioned by General Winterbotham was that aerial photographs gave roof plans and one could not see what was underneath. During the War, of course, that was a constant difficulty and led to much trouble, especially owing to the fact

that there was a great deal of camouflage used. That difficulty, however, had to be faced, and aerial photographs taken were often misleading in important detail.

The paper had interested him very much, and certainly showed the great strides that had been made in the science of flying and of photography.

Captain G. T. McCaw (Colonial Fellow) said he had had the pleasure of reading the paper in advance, and after reading it he said to himself that he had very seldom come across such an admirable presentation of a subject. It had been his duty in the past to read many papers, and Major Brown's was one which, if it was indicative of the new age, spoke very well for the new age.

With regard to the question of secrecy which had been mentioned, he could give two examples of that. Some years ago, when he was at the War Office, a visit was paid to the War Office by Mr. Fairchild, of the Fairchild Camera Corporation of America, and Mr. Fairchild then made it fairly clear that the reason his Company was able to exist was simply because it was more or less a secret institution. If anyone wanted to develop a hydro-electric scheme in America and a surveyor went to survey the spot, prices went up by leaps and bounds, whereas when an aeroplane when over the place nobody paid very much attention to it, and a great deal of Mr. Fairchild's work was of that secret nature. Again, there was a story told about an archæologist who had some photographs taken of ground with which he was very well acquainted, and the airman told him that his own house was set on a barrow ; apparently he had never realised that fact before. The amount of old detail which could be discovered from aerial photographs was very remarkable. One of the most striking examples of that in this country was Woodhenge, which was discovered by that means and would never have been known otherwise.

Turning to the technical side of the new development, which had been illustrated that evening, an interesting point about it was the use of the very long focus lens. There was nothing remarkable about the length of focus, because lenses of 21-inch had been used during the War for detective purposes, but it was the first time, as far as he knew, that the long-focus lens had been applied to large-scale mapping. Major Brown had admirably shown the advantages and the difficulties of the method. He had shown, for example, that the demand on the pilot and the observer was very much greater than before, and really without the automatic pilot he could hardly conceive how the

work could be done properly. It could be done satisfactorily provided that the simple method employed, *i.e.*, the radial-line method, was capable of being used with the very large-scale photographs. A perfectly satisfactory plotting machine had not yet come ; when it did it would enable more difficult operations to be tackled ; but for the present simple method, which had enormous advantages and could be used on the mass production scale (which he thought was really its chief advantage) the long-focus lens, at any rate for large scales, had shown its capabilities. He thought that surveyors (he spoke as a surveyor himself and not as an airman) were making exceedingly heavy demands on the airman, because they probably did not realise the great difficulties that he was up against in such a climate as obtained in this country, and indeed almost anywhere. The difficulty of keeping all the lines parallel was one which very few people could realise. Fortunately now there was the automatic pilot, which was a very great advantage, but the automatic pilot itself was not entirely free from trouble.

Dr. S. Buchan (Geological Survey and Museum) (Visitor) congratulated the Institution on the high standard of the paper which had been presented that evening and also congratulated Major Brown on the excellent way in which he had presented the paper.

Practically the whole of the work of the Geological Survey, he said, was based on the 6-inch and 1-inch Ordnance maps—so far they had had very little occasion to use the 25-inch maps—and they had always counted themselves very fortunate in having such an excellent topographical foundation. In common with others who made frequent use of those maps, the geologists would welcome the recent aid to mapping, which Major Brown had described, if it accelerated the production of up-to-date maps.

From another point of view the Geological Survey looked forward to the results of air photography. In the West Highlands of Scotland, in Skye and in the Shetland Islands, there were no contour lines on the 6-inch maps, and on many of the sheets covering deer or grouse moorland there were very few features to guide the plotting of the geological lines in relation to the topography. In such areas the air photographs, showing, as they would, individual trees, crags, lochans and stone walls, would be of invaluable assistance to the field men and would accelerate the work of the Geological Survey. Differences in vegetation reflected in the photographs might be of use in delimiting surface formations, such as peat, and in separating sands and gravel from clay in glaciated country.

The Geological Survey looked forward to a period of experimental co-operation with the Ordnance Survey on the subject of aerial photography, because they felt satisfied that such photography would prove useful to them, and they wished the Ordnance Survey every success in rearing that young member of the fraternity.

Lieutenant E. H. Thompson, R.E. (Visitor), said that several advantages of the automatic pilot had been mentioned, but there was one to which no reference had been made but which was important in mapping.

Whatever the method used in making the photo-survey, the position of a point was in fact obtained by the intersection of rays from two air stations. As every surveyor could see, that intersection was the more accurate the longer the base was with reference to its height above the ground. If the airman had to allow a very large margin in order to ensure that there should be a small strip of ground common to three photographs, obviously he had to shorten his air base. The more accurately the aeroplane could be flown, the smaller the margin required and the longer the base could be.

In comparing the accuracy of an air survey map with that of a map made by ground methods at the same scale, he thought the air map was usually unfairly treated. If there was any discrepancy —he was referring to discrepancy of position and not of interpretation—the decision was always made in favour of the ground survey, and he considered that that was grossly unfair. In many cases in his own experience it was found that both maps were really in error, and he had made it a point, in all experimental work which involved determining the accuracy of the air map, to compare it only with work done on the ground to a larger scale. Thus the Ordnance Survey 25-inch to the mile air survey plans should not be compared with old work. For a real test of accuracy they should be compared with detail plotted by accurate instrumental traverses.

No mention had been made of the possibility of using expensive automatic plotting machines in the Ordnance Survey. His own view was that they were not instruments which were economically suitable for the work. Undoubtedly if such instruments were in the possession of the Ordnance Survey they could be put to good use, but they were designed for extending ground control as well as for mere tracing detail. Another of their advantages was that they could produce accurate contours which the Ordnance Survey was not out to do. Therefore he thought that they were far too complicated for the present purpose. If one compared the simplicity of the epidiascope, which Major Brown had shown on the

screen, with the complication of some of the instruments in question, and indeed the instrument which the War Office was engaged in producing at the moment, it would be realised what a very great saving in money the epidiascope was. On the other hand, Major Brown and he had discussed the matter and had come to the conclusion that perhaps the method had been simplified a little too much. One of the speakers in the discussion had brought out the point that it was very advantageous to examine photographs in pairs stereoscopically. Major Brown and he were now considering a simple apparatus whereby two images could be projected on the epidiascope table in different colours and examined through coloured spectacles. Some of those present might have seen that method of producing a relief effect in the cinema. The plotting could then be done directly from the relief image, and he was sure that it would increase the speed and also the accuracy of interpretation.

Mr. George T. Railton (Visitor) (New Zealand) said he would like to thank Major Brown for his very interesting paper, which had been particularly interesting to him because air survey work was now being undertaken in New Zealand and was being rapidly developed in that country. If a series of aerial photographs was taken after an earthquake and compared, stereoscopically, with photographs taken previously, it showed the geologist exactly what changes had taken place. Aerial photographs were also useful in showing possible danger of flooding from impounded water behind landslides brought down by earthquakes.

Mr. R. A. Inglis (Professional Associate) asked Major Brown whether consideration had been given to the use of the autogyro for survey work. He suggested that many of the difficulties experienced with the ordinary type of aeroplane could be overcome and a better interpretation made from photographs taken over a well-defined spot on the ground with suitable overlapping. He did not know whether the autogyro had been developed to a stage where it could be sufficiently steady. He would be interested to know what the present position was with regard to it.

The President said he would like to express his own thanks to Major Brown for his most interesting and instructive paper, and for the very delightful pictures that he had shown. He hoped that the interest which the paper had evoked and the discussion to which it had given rise would in some small measure

compensate Major Brown for all the time and trouble he had been good enough to take on behalf of the Institution.

The vote of thanks was then put, and carried by acclamation.

Major R. Ll. Brown, R.E., in reply, said he was gratified to see so many people present that evening; it showed the general interest which was taken in the subject of his paper.

Dr. Buchan had referred to the geological uses of air photographs. One of the points which he had stressed at the end of the paper was that exactly the same position now obtained with regard to photographs as had existed, and still existed, with regard to maps. There were miles and miles of the world unmapped, and yet for every mile of map that was wanted there were at least ten users, working from different angles and all desiring to have the map. Occasionally one of them made a little map for his own purposes, but it was not available to the others. What was needed for mapping as well as for air photography was co-ordination, and that was extremely difficult to obtain. In mapping, only a very little progress had been made towards it, and that was the reason why so much of the world was still unmapped. He had read a most interesting report from America, published by a very learned committee of eminent men which had been set up to examine American mapping, and in that report the fact was deplored that America was still to all intents and purposes unmapped. That was the position in many other parts of the world. The committee said in their report that, if the money which had been wasted because of the lack of adequate maps had been spent by some central body in making a proper map for general use, the whole of the United States could have been mapped many times over. The same problem arose with regard to air photographs. The Ordnance Survey wanted them for certain purposes, and he had no doubt that, if they could be taken by some central organisation, uses could be, and would be, found for them by many other people. In the range of foreign air photography he knew quite well—and he had no doubt that Dr. Buchan knew equally well—that most striking results had been obtained in geological investigations from air photographs.

Mention had been made of a stereo-epidiascope. That would, of course, cut out two complete processes in the present methods of revising from air photographs, and the Ordnance Survey Department was working in close co-operation and examining that subject. He hoped the idea might come to fruition, because it was most desirable.

Finally, reference had been made to the autogyro. It was all very well to hover in the air, but the problem was to get the camera axis vertical at the moment of exposure. That could not be done any better in the autogyro. The autogyro would go as slowly as one wished, but the speed of progress of the aircraft at present was not a source of trouble. It was getting the axis vertical that really mattered.

The following written communication has been received from Major H. HEMMING, A.F.C., F.R.A.S. (Visitor):—

I greatly regret that an urgent call abroad has prevented my attending Major Brown's paper. Major Brown has conferred a benefit on all those concerned with the work of air survey by making a fair and clear statement as to its use for the revision of large-scale plans. This, of course, is only a small but important part of its many applications to mapping and economic development. It is to be hoped, however—as the result of the experimental revision work, of which Major Brown is in charge at the Ordnance Survey—that the use of air photography as a means of speeding up revision will be extended.

As explained in the paper, the revision of the 1/2,500 plans calls for the greatest possible accuracy in flying, and there is no doubt that the three-axis automatic gyro pilot will play an important part in this work. In fact, its application to small-scale mapping in the Empire and abroad should be even greater.

The skill required of the air survey pilot is very great indeed. He has literally to rule straight lines across country, and where no previous maps exist this is very difficult. However skilled the pilot may be he becomes tired after flying for an hour or so, and his flight lines begin to curve and tilts increase. The automatic pilot should enable these difficulties to be overcome.

In referring to flying for large-scale mapping Major Brown considers it necessary to employ three persons, namely, the pilot, the navigator, and the photographer. In my opinion, by using the automatic pilot, it will only be necessary to use a pilot and a photographer. When once in the air, there is very little for the pilot to do; therefore, when once he has put his aircraft on its correct course, and switched on the automatic pilot, he can confine his attention to navigating his aircraft. He would do this by keeping a constant check on drift with his drift sight, or by keeping leading marks in line. Any slight alterations in course

can be made by using the special remote control with which I understand all automatic pilots are provided.

There appears to be no reason why the pilot and photographer between them, assisted by the automatic pilot, should not be able to give Major Brown the accuracy he requires.

In my opinion the automatic pilot will revolutionise the art of air surveying. It should be possible to increase the length of the photographic strips and also stay in the air much longer, so as to take full advantage of good weather conditions. Considerable economies should be effected in lateral overlap and in the plotting of the air photographs.

I am glad that Major Brown has referred to Major Hotine's book—" Surveying from Air Photographs "—as we consider this book our bible in commercial air survey work.

Although the several Continental systems of plotting make a great appeal to the theorist, more territory in this world has been surveyed from the air by the simple British system, so that I have assumed that the Professor's remark can be taken as a compliment.

In closing I would like to emphasise that, while the air photograph provides all the data obtainable by " plane tabling," it may also yield a variety of valuable information on the economic resources of the area photographed.

PAPER NO. 575.

THE PUBLIC HEALTH ACT, 1936.

By Christopher Chart (Member of Council).

Paper to be read at the Ordinary General Meeting of the Chartered Surveyors' Institution on Monday, 1st March, 1937.

On Monday, the 24th of April, 1876, Thomas Huskinson, being then President of this Institution, there were assembled in the Lecture Hall of No. 12, Great George Street, Westminster, under the chairmanship of Edmund James Smith (Vice-President), a meeting of members and associates to hear read by Mr. W. H. Michael (Barrister-at-Law) a paper entitled "The working of the Sanitary "Acts in rural districts." Will you be surprised to learn that this is the only paper in our *Transactions* indexed under the heading "Public Health," except a paper read two years later on a Bill which failed to find its way to the Statute Book. I was, I confess, astonished to find that a subject which so greatly affects those concerned with the management of property had apparently received so little attention at the hands of our members: but the subject is a very large one, and many of the details of public health practice and administration have been discussed in this room. I can recall papers on Building By-laws, on Sewage Disposal and Bacterial Treatment and on Sanitary Law, and in my own paper delivered on the 9th February, 1931, I dealt with some of the problems affecting compensation under the Public Health Act, 1925. Coming as it did immediately after the Public Health Act, 1875, had become law, I thought it might be of interest to the present generation of surveyors to see what the reactions of their predecessors were to the passing of the Act of 1875, but I

am bound to say that Mr. Michael's paper, and the discussion that followed, throws very little light on the subject in that direction.

The paper referred to does not deal directly with the 1875 Act, but is more particularly concerned with the alleged defects of sanitary administration as applied to rural districts, and to complaints that rural districts are not given such full powers as urban ; but, none the less, there are some extracts which may not be entirely lacking in interest at the present time. In the early part of the paper the author remarks that when highway boards were charged with the removal of nuisances they could use their road drains as sewers, but " by the existing law sewers are not " vested in the rural sanitary authorities, and a fertile " source of trouble and difficulty is thus created." Mr. Michael's contention that the same authority should be responsible for both highways and sewers was adopted when the Local Government Act, 1894, came into force ; but since then the wheel has revolved a full circle, and by the Local Government Act, 1929, highways have been removed from the charge of rural district councils and placed under the county councils. *A propos* of his contention that rural authorities are not given sufficient powers, he says " what " possible difference can there be between a house erected " in town or one erected in the country? . . . . If it be " necessary to make by-laws *for purposes of health,* why " are they not necessary in the country as well as the " town?" He complains that the part-time surveyors have been in the past men of indifferent qualifications, devoting only a few hours each week to the work and, for that, very inadequately remunerated ; that " There is a deep-rooted " antipathy in the public mind which found its expression " in the last Parliament against being doctor-ridden " ; that " the work of the surveyor becomes as essential as " that of the medical officer of health and is the due " corollary of it," and, with regard to lack of adequate powers, that " It is to be regretted that the Act of 1875 " so completely centralises action by lodging absolute power

" at every turn in the hands of the Local Government Board " in London," and the paper concludes with a summary of six main points which the learned author advocated, namely:—

(1) Rectification of boundaries, with due regard to considerations of local government and especially of drainage and water supply.

(2) Areas arranged of such rateable values as to secure competent officers adequately paid and reasonably secure in tenure of office.

(3) Representative authorities with uniform powers in all districts.

(4) Adjustment of taxation to benefits received.

(5) Constituent Boards of Appeal combined with central supervision of a Government Board.

(6) Simple and concise laws.

How far we have advanced along those lines I leave you to judge ; those of my listeners who are surveyors to local authorities will unhesitating support recommendation (2), and every one who is subject to the laws of this country will re-echo the desire that those laws should be simple and concise.

To all but a very small minority of our members the Public Health Act, 1875, is the foundation upon which our public health law rests, and if, after over sixty years' working in accordance with its provisions, there are still some members whose professional life commenced before the Act came into force, their recollections of the *ante*-1875 period must be very much overshadowed by the day by day and year by year study that they have had to give to the Act of 1875.

It has been with us for over sixty years, we have been brought up on it, it affects the exercise of every one of our professions, and those of us who are more familiar with

its clauses can confidently quote the numbers of the sections that more directly concern us. It has been amended and added to from time to time, and we have assimilated those amendments, and with the aid of text-books and commentaries have not been seriously incommoded by the fact that public health law is no longer simple or concise. But even we—(I speak as one of the seniors)—find it difficult to remember where and in which of the various Acts we shall find certain provisions, while to our examinees and to juniors coming into the profession the phrase " The Public Health Acts " must present a veritable nightmare.

When I became a Professional Associate of this Institution in January of 1896, there were in force the Public Health Act, 1875, with 343 sections, the Public Health Acts Amendment Act, of 1890, with 52 sections, and nine other Acts passed between 1878 and 1890, comprising in all 39 sections, all of which could be cited as the Public Health Acts. The standard work on the subject was *Lumley's Public Health Acts Annotated,* then in its fourth edition, and which I remember as a single but bulky volume.

To-day there are sixteen statutes which can be cited as the Public Health Acts ; *Lumley's Public Health* is in its tenth edition (published 1930) and comprises three volumes with 3,920 pages, and contains, in addition to the Acts which come within the definition of " Public Health Acts," all other relevant statutes which relate to or affect the law of public health up to the year 1929. Since the publication of that work there have been the two Local Government Acts of 1929 and 1933, to say nothing of minor additions to the Statute Book, so that the law falls very short of being either simple or concise, and we should, I think, welcome the Act of 1936 as an instalment leading to simplification even though it means making ourselves acquainted with new numbering of sections and adjusting our minds to new ideas.

The preparation of a paper on a new Act of Parliament

is no easy task, more especially when it is an Act which is mainly devoted to consolidating the existing law. There are no general principles to be discussed ; nothing novel or thrilling. To attempt to condense the provisions of an Act of Parliament into shorter and simpler language is doomed to failure, for if the Act is well and carefully drafted it should contain no redundant words, and to take away a single word is to change the whole sense of it ; to attempt a paraphrase, which some dictionaries describe as " a copious explanation," would trespass far too much on your patience and the space available in our *Journal,* so that all that is possible, I think, is to try to make it useful to our members by pointing out how the Act came into being, what it covers, and the principal alterations that are made in the general law, so that it may act as a sort of finger-post to those who consult it, directing them to the Act itself. That is one point which I want to emphasise. Do not rely upon this paper for your information as to the law, but do go to the Act and see for yourself what it says. I am sure you will find the paper deadly dull.

The Public Health Act, 1936, received the Royal Assent on the 31st July, 1936, and will come into operation on the 1st October, 1937. It does not extend to Scotland nor, except as expressly provided, to Northern Ireland or London.

Before proceeding to an examination of the measure let us devote a few minutes to considering the genesis of the Act. Why is it necessary? How does it come to take the form it does? A comprehensive and reasoned reply to those two questions is to be found in the second Interim Report of the Local Government and Public Health Consolidation Committee, dated the 10th January, 1936 [1936, Cmd. 5059], from which I have freely quoted in the short summary that follows and throughout this paper.

The collective short title, " The Public Health Acts, 1875-1932," includes sixteen statutes passed between those years, but there are a number of other Acts which plainly fall within the expression " enactments relating to the public

health," though not technically comprised in the collective short title. The great Public Health Act of 1875 is itself a consolidation of a large number of different and overlapping Acts. The Public Health Acts of 1890, 1907 and 1925, which comprise in all 234 sections, are derived from and based on Local Act clauses. This diversity of origin shows itself unmistakably in discrepancies of language, not only between the different Acts but between different sections of the same Act. An Act limited to pure consolidation would have to reproduce all these discrepancies; for this reason the Committee referred to above decided that it was inadvisable to draft a purely consolidating measure coupled with an amending Bill effecting such alterations in the law as might be desirable for the purposes of simplification and clarification, and that the necessary amending Bill would have contained so large a mass of detailed amendments that it would have been little shorter and far less intelligible than the amending and consolidating Act which we are considering. The Departmental Committee to which I have referred was originally set up by the Minister of Health on the 5th December, 1930—

> " with a view to the consolidation of enactments applying to England and Wales (exclusive of London) and dealing with (*a*) local authorities and local government and (*b*) matters relating to Public Health, to consider under what heads these enactments should be grouped in consolidating legislation and what amendments of the existing law are desirable for facilitating consolidation and securing simplicity, uniformity and conciseness."

Its First Interim Report was made in March, 1933, and the first instalment of the projected legislation for consolidating and simplifying the law of local government and public health found its way to the Statute Book in the Local Government Act, 1933.

The Public Health Act, 1936, represents a further instalment ; it does not cover the whole of the law comprised in the Public Health Acts, a number of subjects such as streets, open spaces and markets being left for further codes. The Departmental Committee in their Second Interim Report,

after outlining the heads under which the various provisions of the Public Health Acts may be grouped, go on to say—

> " to deal with the subject matters grouped under these heads in a single measure would, we estimate, involve a Bill of not less than one thousand clauses. On consideration we are satisfied that the balance of advantage lies in the direction of several Bills each of moderate lengths. On the whole, therefore, we consider that both from the point of view of local authorities and their officers and from that of the public at large, a series of Bills, the longest of which would not exceed some 350 clauses, is more convenient than a single comprehensive measure " ;

and as the Public Health Act, 1936, comprises 347 sections, we may confidently anticipate that two further measures will be necessary before the whole of the law is codified and consolidated.

The Departmental Committee also refer to the number of " adoptive " Acts which operate only after they have been adopted by a local authority or put into force by the order of a central authority, and instance the Infectious Disease (Prevention) Act, 1890, the Public Health Acts Amendment Act, 1890, and Parts II., III., IV. and V. of the Public Health Act, 1925, which can be adopted, and the Public Health Acts Amendment Act, 1907, which can be put in force by the Minister on the application of the local authority ; and they set out the number of authorities that have adopted Part III. of the Act of 1890, with which alone the present Act is concerned, the particulars as on 1st December, 1933, being as follows:—

—	Total numbers excluding London.	Numbers adopting Part III.	Percentage of Total.
Boroughs	356	306	85·95
Urban Districts ...	739	673	91·07
Rural Districts ...	600	398	66·33
Totals ...	1,695	1,377	81·24

These figures show that the provisions are in force over a very wide area. They do not represent the whole number of areas since they do not include those where very similar powers are obtained from local Acts, but they lead to the conclusion that the time has arrived when, with certain exceptions, they may properly be made of general application, and the Act of 1936 has been framed accordingly, with a resulting simplification of the public health law.

Let us turn to the Act itself and see what it does provide. It is divided into twelve parts, with main headings and sections as in the Table following:—

Part.	Sections.	Main Heading.
I. ...	1-13 ...	Local Administration.
II. ...	14-90 ...	Sanitation and Buildings.
III. ...	91-110 ...	Nuisances and Offensive Trades.
IV. ...	111-142 ...	Water Supply.
V. ...	143-180 ...	Prevention, Notification and Treatment of Disease.
VI. ...	181-199 ...	Hospital and Nursing Homes.
VII. ...	200-220 ...	Notification of Births, Maternity and Child Welfare and Child Life Protection.
VIII....	221-234 ...	Baths, Washhouses and Bathing Places.
IX. ...	235-248 ...	Common Lodging-houses.
X. ...	249-258 ...	Canal Boats.
XI. ...	259-270 ...	Miscellaneous.
XII. ...	271-347 ...	General.

In addition there are three Schedules:—

No. 1.—Provisions as to medical officers of health and sanitary inspectors of port districts.

No. 2.—Sections extending to London for certain purposes.

No. 3.—Enactments repealed.

Members practising in London may like to know that all the sections referred to in Schedule 2 are to be found in Part XII. under the comprehensive, but not very illuminating, heading of "General." Schedule 2 is not completely exhaustive ; for example, the whole of Part X. (Canal Boats) is applied to London by Sec. 286 ; Sec. 28, dealing with communication of sewers with sewers of another authority, and Sec. 98, dealing with procedure when a nuisance arises outside the local authority's district, also extend to London.

We instinctively pick on Part II. (Sanitation and Buildings) as being that Part of the Act most likely to affect the surveyor's practice, and to that Part of the Act this paper is more particularly directed. There are sections in other parts which affect that practice, and with these I will endeavour to deal, but my reference must not be considered exhaustive.

Let us, then, turn to Part II. and see what provisions are made with regard to Sanitation and Buildings. I have already pointed out that the Act is mainly a consolidating one, and I propose accordingly to deal in the body of the paper with the principal alterations in the law so far as I have been able to discover them. To assist me in this discovery I made for my own use, from information given in the draft Bill prepared by the Departmental Committee, a Table relating to Part II. of the Act showing under the appropriate sub-heading the number of each section, together with a reference to the appropriate section of earlier Acts whose place they take. I have found this a useful Table to have by me, and hoping that it may be of some service to you, I have appended it in the form of an appendix, and you will find it printed if you will turn to the end of the paper (see page 228).

A very brief examination of this Table shows certain sections as being entirely new (Nos. 17, 18, 21, 24, 38, 51, 62, 63, 67, 68, 70, and 74) while others are based wholly or in part on local Acts, and are therefore new to the

country as a whole (Nos. 55, 60 and 75), and it is to some of the matters contained in these two groups of sections that I shall presently direct your attention ; but first, let me put in a word of warning, it is this: Do not assume that all the other sections are mere consolidation without amendment, they are not ; for example, Sec. 15 of the 1875 Act says:—

> " Every local authority shall keep in repair all sewers belonging to them and shall cause to be made such sewers as are necessary for effectually draining their district for the purposes of this Act " ;

while Sec. 14 of the Act of 1936 says:—

> " It shall be the duty of every local authority to provide such public sewers as may be necessary for the effectual drainage of their district for the purposes of this Act and to make such provision by means of sewage disposal works or otherwise as may be necessary for effectually dealing with the contents of their sewers."

Drains and Sewers.

Important amendments are made in the law relating to drains and sewers. Under the Act of 1875 a " drain " means any drain used for the drainage of one building only, and made for communicating with a cesspool or sewer, and a " sewer " as including any other drain save those vested in a separate highway authority or made for private profit, and all such " sewers " vest in the local authority and are maintainable by them. Under the " adoptive " provisions of Sec. 19 of the Act of 1890 where " Two or more houses " belonging to different owners are connected with a public " sewer by a single private drain " Sec. 41 of the Act of 1875 is to apply, and the authority may make good a defective drain and recover their expenses in suitable proportions from the owners concerned.

Members of the Institution hardly need to be reminded

of the disputes arising on Sec. 19 of the Act of 1890, and on the definition of "drains and sewers" in the Act of 1875; and of the large number of judicial decisions thereon, are they not recorded in the pages of our *Professional Notes* and the *Journal*, to say nothing of the questions asked and answered through the medium of "Queries and Replies"? The Judges have referred in no uncertain terms to this unsatisfactory state of affairs, characterising them as "entirely unsystematic and highly confused," "chaotic "and contradictory" and "a disgrace to English "legislation." Under the Act of 1936 (Sec. 343) a "drain" means a drain used for the drainage of one building or of any buildings or yards appurtenant to buildings within the same curtilage, and "sewer" does not include a drain as defined in this section, but, save as aforesaid, includes all sewers and drains used for the drainage of buildings and yards appurtenant to buildings, and these sewers are either "public sewers," as defined by Sec. 20 of the Act, or "private sewers," defined as any sewer which is not a public sewer.

Sec. 20 provides that there shall vest in the local authority—

(1) All sewers vested in them prior to the Act of 1936;

(2) All combined drains constructed prior to the Act of 1936;

(3) All sewers constructed at the expense of the local authority;

(4) All sewers constructed in the execution of works of making up of private streets;

and all the above are to be known as "public sewers," the only exception being sewers constructed by the authority after the Act for draining their own properties, *e.g.*, a housing estate.

Sec. 23 places the duty of maintaining, cleansing and

emptying all public sewers on the local authority, but must be read in connection with Sec. 24, under which the local authority may recover the cost of maintaining certain lengths of public sewers from the owners of premises served by such sewers in proportions laid down ; these lengths are (*a*) those which the owners of premises using them were liable to maintain prior to the Act of 1936 ; and (*b*) sewers lying in private property or in roadways used as means of access, not being highways repairable by the inhabitants at large, and which, although vested in the local authority before the commencement of the Act, were not constructed at their expense.

It remains to be seen to what extent the law, as laid down in the Act of 1936, disposes of the " drain " or " sewer " difficulty. Sec. 24 (4) (*a*), read by itself, leaves open the whole field of controversy just as we have it now. Sub-sec. (4) (*b*) does, I think, definitely fix the liability for maintenance of the great majority of those lengths of drain or sewer which have been the bone of contention in the past. I should welcome the opinion of our Associate Members on this point, and I should like to ask whether this last provision relieves local authorities of some burdens now carried by them ; *e.g.*, a developer laid out an estate on a gridiron plan for terrace houses, and provided a main sewer laying in the access road at the back of his shop plots crossing the estate roads at right-angles so that it serves to pick up both the drains from the shops and combined drains from the terraces behind them ; such a main sewer consists of alternating lengths of 40 feet in the estate streets and 200 feet in the access roads, and has already over 500 houses draining through it ; presumably costs of maintenance of the portions in the access roads will be apportioned among them instead of being borne by the local authority as at present.

The duty which Sec. 15 of the Act of 1875 throws upon local authorities to provide sewers for the drainage of their district does not require them to provide sewers in antici-

pation of the future requirements of their district or to enable a landowner to develop his land for building purposes. In urban districts sewering of private streets may be effected at the cost of the frontagers as part of the operation of making up the street under Sec. 150 of the Act of 1875 or the Private Streets Works Act, 1892, but as "making up" is seldom done until the street is more or less built upon, the developer generally finds it advisable to lay the necessary sewers at his own expense, a course which does not seem to have been contemplated when the Act of 1875 was passed. Complaints are sometimes made that the demands of local authorities as to size, depth and mode of construction are more onerous than they should be and that this is a matter which should be regulated by by-laws. Sec. 40 of the Act of 1925, if adopted, remedied this to the extent that increased size shall be paid for by the local authority. Sec. 19 of the Act of 1936 puts this on a more equitable footing. The local authority may require the owner to construct the sewer in such a manner as regards materials, size, depth, gradients and outfall as will fall in with the general system, and the extra expenses reasonably incurred are to be repaid to the owner by the local authority. There is an appeal to the Minister as to the reasonableness of the requirements and to a court of summary jurisdiction on the amount of the repayment, and, as will be seen later (Sec. 61), power is given to make by-laws respecting private sewers.

Adoption of Sewers. (Secs. 17 and 18.)

The process of adoption of sewers is one of the most important changes made in the law, and I direct your special attention to it. We are familiar with the adoption of streets after they have been made up under the Private Streets Works Act, 1892, or Sec. 150 of the Act of 1875. The application of a similar process to sewers is novel, and it is not so easy to see how it will work out in practice.

As the law stands to-day a sewer laid by an owner for the development of his estate and connected to the main sewers of the local authority, *ipso facto* becomes a sewer vested in the local authority, and the landowner who has borne the expense of it has no more rights over it than any other member of the public who may connect his drains to it and make use of it, provided he can get to it, without having contributed a farthing to its cost. Some owners resent this and regard it as a hardship, and that their views are, to some extent, supported by their professional advisers is evident by queries that have been addressed to fellow-members, as can be seen in the pages of "Queries and "Replies." The alteration to be made in the law will remedy this, if remedy be needed, but there is another aspect of it ; once the sewer is vested in the local authority they become responsible for its upkeep and maintenance, and the responsibility of the landowner who laid it ceases. In a case in my own experience a landowner paid for the laying of a sewer in advance of development, the land remained undeveloped for about forty-five years, when it was purchased and developed by clients of my firm, the local authority submitted the sewer to tests and came to the conclusion that it was not sufficiently sound to serve as a soil sewer, but were compelled to admit that such relaying as they thought necessary would have to be done at their own expense and not at that of my clients. It is obviously unusual that a sewer should lie idle for so long a period. Under the Act of 1936 such a case would not be likely to arise. I anticipate the normal procedure will be for the developer to submit his sewering proposals, coupled with a request that the sewer be adopted on some future date or happening, and, pending such adoption, it will remain his private sewer, and he will be able to make such terms as he thinks fit for the use of it by other owners. During the time that it remains a private sewer it must, of course, be maintained by him. It will be up to him to see that nothing is done which will prevent its adoption in due course, and I would particularly suggest that he should

insist that all connections to such a private sewer should be made by the local authority.

Sec. 17 deals with the general power to adopt sewers. It provides for an appeal to the Minister when either the authority decide to adopt without the consent of the owner or the authority refuse to accede to the owner's application for adoption. It lays down the circumstances to which the Minister shall have regard and gives him power to specify conditions, including award of compensation, and Sec. 18 deals with the power of the local authority to agree to adopt a sewer at some future date. The provisions for the adoption of sewers also apply to sewage disposal works, which are not defined, but would, I think, include a pumping plant put in to lift to a higher level sewer, as these would be works "necessary for "effectually dealing with the contents of their sewers," to quote from Sec. 14.

Under Sec. 20 of the Act of 1875 the local authority may make a map of their sewers, and by Sec. 4 of the Amendment (Support of Sewers) Act, 1883, they must make such a map as a precedent to recovering damages for subsidence, a provision that is probably observed in mining districts. Under Sec. 32 of the Act of 1936 the making and keeping open for inspection of a map becomes compulsory, it must show (*a*) public sewers ; (*b*) sewers declared to be vested but the vesting is not yet effective ; and (*c*) sewers in respect of which there is agreement to declare them vested later ; they must be shown and distinguished if they are reserved for foul or surface water only, but if for the dual purpose need not be shown if they were vested in the authority before the 1936 Act ; by Sec. 25 no building may be erected over sewers *shown on this map* without consent. Provision is made for an appeal to a court of summary jurisdiction as to terms of consent, and for enabling local authorities to require the alteration or taking down of buildings erected over sewers without consent previous to the commencement of the Act.

Private Sewers and Drains.

Put quite briefly, the owner of a private sewer has all the rights of connecting and discharging the contents of his private sewer to a public sewer as he now has for a private drain, provided that its condition is satisfactory, that due notice is given, and that the work of connecting is either made by the local authority or under their supervision (Sec. 34).

The obligation to provide new buildings with the necessary drains is clarified in Sec. 37, and must be dealt with in submitting plans for new buildings. It will no longer suffice to show drains terminating in the centre of a street where there is no sewer.

Combined Drainage.

Sec. 38, which deals with this subject, is an entirely new provision added to the Bill during the Committee stage. The procedure is very similar to that in operation in the metropolis, and will be familiar to London members. When the drains are first constructed the local authority may require combined drainage by means of a private sewer, but cannot, without the consent of the owners concerned, require the drainage from premises, the plans of which have been previously passed, to be included.

Sanitary Conveniences.

Sec. 39 of the Act of 1907 provides that where there is a sufficient water supply and sewer and the local authority require the conversion of a closet into a water-closet and serve a notice to that effect, which is not complied with, and they do the work in default, it is obligatory on them to contribute one-half the cost in the case of a closet other than a pail-closet, and the whole cost in the case of a pail-closet, but gives them no power to contribute if the owner

complies with their notice, and consequently is a direct incentive to such default by an owner. This curious anomaly is remedied by Sec. 47 of the Act of 1936. If the work is done on the requisition of the authority they must bear half the cost whoever carries out the conversion, and if the owner proposes the conversion without such requisition, the authority may, but are not compelled, to contribute up to half the cost.

Supplemental Provisions.

Sec. 50 deals with overflowing cesspools re-enacting Sec. 47 (3) of the Act of 1875. Some doubts have been expressed as to whether this provision in the 1875 Act prohibited overflows from a septic tank. The 1936 Act clears up this doubt. Sec. 50 does not apply to the effluent from a properly constructed tank for the reception and treatment of sewage if the effluent is of such a character and is so conveyed away and disposed of as not to be prejudicial to health or a nuisance.

Sec. 51 appears to be new: it provides that the occupier of a building fitted with a water-closet must keep the flushing apparatus supplied with water and protected from frost.

Provisions with respect to Buildings.

Under this heading there are incorporated in the general law a number of provisions that have received the sanction of Parliament in local Acts.

Licences for temporary buildings are now dealt with under Sec. 27 of the Act of 1907, which will be repealed by the 1936 Act, in place of which we shall have Sec. 53 of the 1936 Act making special provisions for buildings constructed of materials which are short-lived or otherwise unsuitable for permanent buildings. The section contemplates that

there will be special by-laws dealing with buildings in this category.

Sec. 55 provides that when plans for the erection or extension of new buildings are submitted they shall be rejected unless satisfactory means of access for removal of house refuse is provided.

Sec. 58 deals with dangerous and dilapidated structures, and represents a combination of the provisions of Secs. 75-78 of the Towns Improvements Clauses Act, 1847 (incorporated in the Public Health Act, 1875, by Sec. 160 thereof) , and of common local Act provisions. Under the present law, if a building in an urban district is in a ruinous state and dangerous to passengers or to occupiers of neighbouring buildings, the owner must take it down or repair it. Sec. 58 of the Act of 1936 provides that if a building is (*a*) in such a state as to be dangerous to its occupants or to adjoining buildings or premises, or (*b*) by reason of its dilapidated condition a source of annoyance or detrimental to the amenities of the neighbourhood, it shall be repaired or demolished, or the use, if constituting the danger, discontinued. It will be noted that no mention is made of buildings which are dangerous to passengers, and the Departmental Committee say in the Appendix to their Report " provisions dealing with dangers to passengers in " streets are not included in this Bill." I think that this is a defect in the Measure. It would surely have been for the general convenience if all the provisions for dealing with dangerous structures could have been dealt with together.

Sec. 59 deals with means of ingress and egress to places of public resort which, by this section, is extended to cover shops, stores and warehouses to which the public are admitted and where more than twenty persons are employed, and to registered clubs.

Sec. 60 deals with means of escape from high buildings in case of fire, and applies to any building more than two storeys in height and having an upper floor more than

20 feet above the surface of the ground which is let in flats or is used as an inn, boarding house, hospital, school or similar institution, or as a restaurant or shop having sleeping accommodation on the upper floor, and is retrospective.

By-laws with respect to Buildings and Sanitation.

Important alterations are made in the law with regard to building by-laws, and the whole of Secs. 61-71 should be carefully studied. The general power to make by-laws as regards (*a*) buildings, (*b*) lighting and ventilation and sizes of rooms, (*c*) height of buildings, (*d*) sanitary fittings, (*e*) ashpits, (*f*) wells, tanks and cisterns, (*g*) stoves and fittings, and (*h*) private sewers, and as regards the giving of notices, deposit of plans, inspection of works, testing of drains and taking samples of materials, will be found in Sec. 61, which takes the place of the existing provisions, which, as will be seen from the Table in the appendix to this paper, are now found in the Acts of 1875, 1890 and 1907, and in many local Acts. By-laws relating to lighting are new, as are those relating to sizes of rooms used for human habitation, although Sec. 23 of the Act of 1890 confers powers as to heights. It is doubtful whether by-laws relating to size (apart from height) of rooms will be required, having regard to the provisions of the Housing Act, 1925, Schedule 1. It should further be noted that this section applies to all local authorities, urban and rural. Sec. 62 clears up the obscurity of the existing law as to the effect to which by-laws are retrospective, and Sec. 63 provides greater elasticity by giving the local authority power to relax the requirements of the by-laws in certain cases subject to the consent of the Minister. Secs. 64, 65 and 66 call for no comment here. Sec. 67 is designed to secure that where a question arises between the local authority and the building owner as to whether plans conform to the by-laws or work has been executed in accordance with the plans, the parties may jointly submit the question for the determination of the

Minister ; the usual provision is made for the Minister to state a case for the opinion of the Court, or for either party to apply to the Court for a direction to do so. This section should obviate some of the difficulties that now arise when there is a genuine difference of opinion, and the only ruling that can be obtained is by proceeding with the work and defending a prosecution for infringement of the by-laws at petty sessions.

Sec. 68 secures the reconsideration of by-laws at regular intervals. All existing by-laws cease to have effect on the 31st July, 1939, and all by-laws made under the Act of 1936 cease to have effect on the expiration of ten years from the date they were made. The Minister set up a Committee in November, 1936, to consider and draft new model clauses in readiness for the reconsideration of all by-laws, which must take place during the next three years.

It is a matter of frequent complaint that whereas local authorities are required to print their by-laws and place them on sale, there is no such obligation as regards by-law-like provisions in local Acts, so that a building owner and his advisers have no ready means of ascertaining the nature and extent of their obligations. Sec. 70 requires local authorities to append to their printed by-laws the relevant sections of local Acts, and empowers the Minister to determine the question whether any particular section of a local Act should be so appended. It also requires rural district councils to append a statement of urban powers in force in their district, and all local authorities to append a statement whether and, if so, at what date certain provisions of the Public Health Acts came into operation in their district, as these affect both the powers of the local authority and the obligations of owners.

Removal of Refuse, Scavenging and keeping of Animals.

Local authorities, although under no legal obligation to remove refuse or clean cesspools, are now authorised to do

so and to make an appropriate charge for such services (Secs. 73 and 74).

The distinction between "house refuse" and "trade refuse" is left undefined. The difficulties of definition are discussed in the Report of the Departmental Committee, which point out that in the Public Health (London) Act, 1891, both are defined ; but, in spite of this, there is much case law and still a considerable difficulty in determining in London into which category any particular refuse falls.

Those who manage cottage property may be interested to know that the local authority may prescribe regulation dustbins when replacements are necessary, or may themselves provide and maintain such dustbins at an annual charge of 2*s*. 6*d*. recoverable as part of the general rate. The recognition of the dustbin—defined as "a movable receptacle for ashes or refuse"—is a small item in which the Act has been brought into line with modern usage. The Act of 1875 dealt with "ashpits," and this term is still used in the by-law sections as applicable to the fixed receptacle. Under the heading of "General" comes one section only—Sec. 90—which is an interpretation clause applicable to Part II. of the Act. Sub-sec. (2) follows generally the language of Sec. 23 (*a*) and (*e*) of the Act of 1907 in defining certain operations which are to be deemed to be "the erection of a building," but qualified by the addition of the words "so far as the by-laws may provide." Some of the difficulties that have arisen as regards the question of whether there is or is not a sewer within 100 feet of a house have been cleared up. The sewer must be not only within the prescribed distance ; it must be reasonably practical to drain into it, and it must be so situate that you do not have to trespass to get to it.

Passing from Part II. of the Act, there are other sections that may be of interest to us in our profession as surveyors.

Sec. 92, dealing with statutory nuisances, abolishes the minor distinctions between the ventilation requirements for domestic factories and workshops and men's workshops,

and its provisions apply alike to all places not regulated by other codes where persons are employed other than in domestic service.

The amendments in the law as to provision of water supply will be of interest to those members whose practice extends to rural areas where this question often becomes acute. Sec. 62 of the Act of 1875 provides that the local authority may require the owner to provide such supply if it can be furnished at a cost not exceeding the authorised water rate or, if there is no authorised rate, at a cost not exceeding 2*d*. per week or such sum as the Minister may determine to be reasonable. Sec. 3 of the Public Health (Water) Act, 1878, provides that in rural districts the owner of an occupied dwelling-house may be required to provide such a supply if it can be furnished at a cost not exceeding a capital sum the interest on which, at the rate of 5 per cent. per annum, would amount to 2*d*. per week or such sum, not exceeding 3*d*. per week, as the Minister may determine to be reasonable. It will be noted that while dealing with substantially similar cases the earlier section protects the owner by a limit in annual cost, the latter does so in terms of capital expenditure. In the Act of 1936 a definite limitation of £20 capital cost per house is substituted for these provisions.

Section 52 of the Act of 1875 prohibits the construction of waterworks by local authorities within the limits of supply of statutory undertakers able and willing to supply the water required. In little developed areas urgently in need of water it may be impossible to satisfy the conditions for a requisition under Sec. 35 of the Waterworks Clauses Act, 1847, and the cost of complying with such a requisition might well be greater than the cost of a local supply afforded by the local authority. Sec. 116 (2) and 117 of the Act of 1936 meets this difficulty. The local authority must obtain the consent of the undertakers, but such consent must not be unreasonably withheld, and of the reasonableness of refusal the Minister is the judge. Power is given

to undertakers to themselves supply after notice and repayment of the appropriate portion of the local authority's expenditure.

Sec. 116 (3) prohibits a local authority from "constructing any works for taking or intercepting water without the approval of the Minister." This sub-section is new and is designed to prevent works being done to the prejudice of the water supply of another area.

Sec. 116 (6) empowers the Minister to make provisional orders for repealing or amending local Acts where the local authority have acquired an undertaking operating under an order made under the Gas and Waterworks Facilities Acts, 1870 and 1873, without the expense of promoting a local Act for the purposes of the amending order.

Sec. 121 deals with the powers of owners and occupiers for opening streets for the purpose of laying water supply pipes. It will be more convenient to deal with this in connection with Secs. 279-282 *infra*.

Charges for water and water rates are dealt with in Secs. 126-131. In the first draft of the Bill it was proposed to authorise additional charges for (*a*) any water-closet beyond the first, (*b*) any fixed bath beyond the first, and (*c*) water supplied by a hosepipe for horses or for washing vehicles. On it being pointed out that the use of the first of these conveniences by any individual was not determined by the number of w.c's. in the house (*a*) disappeared and is not in the 1936 Act. The same argument would apply in a lesser degree to (*b*), especially as the higher rateable value of the house with two or more bathrooms would bring in a larger sum in payment for water. In the Act of 1936 (*b*) and (*c*) remain. Supplies for purposes of trade, public institutions, hospitals, schools, licensed premises and boarding houses accommodating twelve or more visitors must be taken by meter, as must be water used in connection with refrigerators or any apparatus dependent on a running supply. Water rates on houses let on monthly or weekly tenancies or of a lower net annual value than £13 may be

demanded of the owners, and, if the local authority so determine, water rates may be recoverable half-yearly.

Sec. 132 gives power to the local authority to make by-laws for preventing waste and for prescribing the size, nature, materials, strength and workmanship of fittings, and that these may not become obsolete they cease to be effective after the expiration of ten years.

Parts V., VI., VII., VIII., IX. and X. do not greatly affect the surveyor's practice, though it may be of interest to note that under Sec. 233 the local authority are given powers to make by-laws with respect to swimming baths and bathing pools, which are open to the public and not under their management, for securing the purity of the water therein and the adequacy and cleanliness of the accommodation thereat. During the last few years there have been established a large number of open-air bathing pools, and it is a matter of importance that not only the water should come from an uncontaminated source but that steps should be taken for keeping the water pure.

Part XI.—Miscellaneous.

In this Part of the Act I would draw your attention to Secs. 258-265, which relate to watercourses, ditches and ponds. They are drawn mainly from the Act of 1925, Secs. 51-55, which was enacted before the passing of the Land Drainage Act of 1930. While this later legislation has diminished the need for some of the provisions of the Public Health Acts, it has given rise to the possibility of a conflict of jurisdiction between sanitary authorities and drainage boards. The Departmental Committee in their Report suggests that in view of the general establishment of drainage boards inside the Act of 1930 and the powers conferred on county councils and county borough councils by that Act, the powers of all local authorities under

Secs. 258-263 should be co-ordinated with the activities of drainage boards ; but inasmuch as this Act is designed to prevent danger to health, it is not desirable that a drainage board should be able to veto health proposals. Instead of requiring the " consent " of the drainage board, the Act provides for prior consultation with them.

Secs. 268 and 269 will, I am sure, be welcomed by everyone in my own county of Surrey and everywhere else where the nuisance that arises from uncontrolled use of movable dwellings constitutes a serious menace to the amenities of the countryside. Sec. 268 deals with nuisances re-enacting the provisions of the Housing of the Working Classes Act, 1885, Sec. 9, and the Public Health Act, 1925, Secs. 43 and 50. Sec. 269, which was not in the first draft of the Bill as prepared by the Departmental Committee, gives powers to the local authority to control the use of movable dwellings. Under its provisions the local authority may grant licences (*a*) allowing land to be used as sites and (*b*) authorising persons to erect or station movable dwellings subject to conditions laid down. There are saving clauses which enable land to be used for camping purposes for not more than forty-two consecutive days or for more than sixty days in all in any one year, so that the *bonâ-fide* holiday camper will not find it any restriction ; a further saving clause exempting from the provisions of the section a movable dwelling kept by its owner on land occupied by him in connection with his dwelling-house and used only by himself or members of his household and those kept by their owner on agricultural land occupied by him and used for habitation only at certain seasons and only by persons employed in farming operations ; for those used by travelling circus and roundabout proprietors for the purposes of their business and for those not in use for human habitation, and there are safeguards to prevent the evasion of the Act by preventing the moving of a dwelling for the purposes of reckoning the length of its stay unless it is moved to a site more than 100 yards from that it formerly occupied.

Part XII.—General.

Sec. 278 deals with compensation and re-enacts the provisions of Sec. 308 of the Act of 1875. The limit of jurisdiction conferred on a court of summary jurisdiction is raised from £20 to £50, and is extended to cover the question of liability. Sub-sec. (3) says that no compensation shall be payable on a local authority declaring a sewer to be vested in them. Sub-sec. (4) lays down that in determining the damages sustained by laying a sewer or water main through private property there shall be a set-off for betterment, if any. I draw attention to this point because the whole question of conferring the right to recover the cost of laying sewers through private property from the frontagers should a street ever be constructed over the course of the sewer was under consideration by a Joint Committee of the Lords and Commons on the deposit of private Bills by local authorities seeking such powers and following the precedent of the Romford Urban District Council Act, 1931. In their Report, dated 17th June, 1936, the Joint Committee recommend "There should be no set-off in "respect of enhancement of value in assessing the com-"pensation payable at the time of the original construction "of the sewer to the land traversed by it" (*vide* our *Journal*, Vol. XVI., page 270).

Secs. 279-282 deal with the general provisions for *breaking open of streets* and savings for statutory undertakers. This matter is also dealt with in Part II., Sec. 34 (Drains and sewers); in Part IV., Sec. 121 (Water mains and services); and in Part VIII., Sec. 227 (Pipes for supply of public baths and washhouses). The Departmental Committee's Report refers to the changes made by the Local Government Act, 1929, whereby the county council becomes the highway authority in rural districts, and goes on to observe:—

> "There seems no good reason why in this respect" [*i.e.*, the breaking up of streets] "the construction of sewers, the laying of water mains, and the laying of pipes for supplying

public baths should not be on the same footing. Moreover, the question whether the superintendence and control for which the incorporated sections provide should be imposed ought clearly to depend upon whether the authority executing the works are the highway authority *for the street in question* and not whether they have or have not any highway functions in general."

And—

"The power of owners and occupiers of premises to break up streets also needs consideration. Sec. 52 of the Waterworks Clauses Act, 1847, confers such a power for the initial laying of the pipe, subject to the same control and obligations as apply to water undertakers. Local Acts commonly extend this power for the purposes of examination and maintenance and repair of pipes. There is, however, no general power—at any rate no express power—to break up streets for the purposes of connecting drains to sewers, though Sec. 37 of the Act of 1925 empowers a local authority to do the work on behalf of the owner or occupier by agreement in a private street."

The Act of 1936 proceeds on the lines foreshadowed in the Report.

Sec. 287 deals with powers of entry and obstruction. I refer to this section not as being one in which we as surveyors are vitally interested, but as showing how great is the need for consolidation of the public health law, and again I quote from the Departmental Committee's Report:—

"the public health law contains a wide variety of provisions conferring powers of entry. In the portions of the Act of 1875 with which the present Bill deals, there are four powers (Secs. 41, 102, 137 and 305). A further power in the same Act provides for entry for the purpose of inspecting meat, and no less than eight further powers are to be found in the Public Health (Water) Act, 1878, and the Public Health Acts of 1890, 1907 and 1925. . . . For the sake of shortening and simplifying the legislation, it is clearly desirable, so far as possible, to substitute a single code for these numerous provisions."

Sec. 292 authorises a local authority to make a charge

for establishment charges when they execute works and can recover the cost. They have this power when they make up streets under the Private Streets Works Act, 1892, but not when they operate under Sec. 150 of the Public Health Act, 1875.

Throughout the Act generally there is frequent reference to a court of summary jurisdiction as the tribunal to decide matters in dispute. Many of these matters are highly technical, and to the technical man the idea of leaving the decision in the hands of a bench of laymen is repugnant. Representations to this effect were made to those concerned in the drafting of the measure. While sympathetic consideration was given to the suggestion, it was pointed out that if an option were given to an owner of going to a technical arbitrator, it would not be possible to resist giving a similar option to the local authority. As arbitration was probably more expensive than petty sessions, and as the authority usually had the longer purse, it was doubtful whether the adoption of the suggestion would in practice be to the advantage of the owner.

Lastly, the term " owner " is defined in the interpretation clause, Sec. 342, in identical language to that used in Sec. 4 of the Act of 1875. Members will recall the decision under the Housing Act, 1925, in the case of *Watts* v. *Battersea Borough Council* (*vide Journal*, Vol. VIII., pages 295 and 442) and the representations made by the Council of this Institution to the Minister as to the injustice of imposing upon agents a personal liability beyond the estate funds in their hands, which resulted in the amendment secured by Sec. 18 (3) of the Housing Act, 1930. The Council were able to make representations to a similar effect in the proper quarter before the Public Health Bill was introduced, and it is a source of satisfaction to know that by Sec. 294 of the Public Health Act, 1936, the liability of agents, so far as that Act is concerned, is limited to the same extent as is provided in the Housing Act, 1930.

In conclusion, may I repeat what I have said in the early

part of this paper? It is impossible to paraphrase even a single section of an Act of Parliament. A paper of this sort affords no scope for flights of fancy nor, I think, for suggestions of how the same ends might be reached by some different manner of approach, for that is apt to leave in the minds of its hearers a vague impression that they have heard something, somewhere and somehow, which, in fact, is not in the Act of Parliament at all.

Our Royal Charter sets out the objects for which the Chartered Surveyors' Institution was established. They are important to the body politic, and the furtherance of them is one of the objects of individual membership of the Institution ; but I am one who holds that there is in our membership something more than that—not the acquisition of professional knowledge, not the privilege of putting the designatory letters after our name, but in making our contribution (" doing our bit," to use a colloquial phrase) for the service of our fellow-members. Insomuch as this paper, by acting as a finger-post to the Act, is of service to my fellow-members—I know that it is a useful and good one—no one but the author himself could be so conscious of its many imperfections.

APPENDIX.

PUBLIC HEALTH ACT, 1936.

TABLE OF SECTIONS IN PART II., SHOWING THE SECTIONS OF EARLIER ACTS WHOSE PLACE THEY TAKE.

P.H.A. 1936.	P.H.A. 1875.	P.H.A. 1890.	P.H.A. 1907.	P.H.A. 1925.	Other Acts or Orders.
		SEWERAGE AND SEWAGE DISPOSAL.			
14	15				
15	14, 16, 27				Local Government Act, 1894, s.16 (3)
16	32, 33, 34			78	
17					
18					
19				40	
20	13	19, part			
21					
22	18, part				
23	19, part				
24					
25	26, part				Order No. 580, 1931
26					Rivers Pollution Act, 1876, s. 7
27		16, 17		41	
28	28				
29	29				
30	17				
31	18, 19, 27 pts				
32	20				Order No. 580, 1931
33	31				
		PRIVATE SEWERS, DRAINS AND CESSPOOLS.			
34	21		38		
35	22				
36				38	
37	25		49	36	
38					
39	23, 41		34		
40			36, 37	42	
41				39	
42	24				
		SANITARY CONVENIENCES FOR BUILDINGS.			
43	35		39 (2)		
44	36, part		39 (4)		
45	36, part				
46		22			
47			39 (4)		

P.H.A. 1936.	P.H.A. 1875.	P.H.A. 1890.	P.H.A. 1907	P.H.A. 1925.	Other Acts or Orders.
Supplementary Provisions as to Drains, Sanitary Conveniences and Cesspools.					
48	41		34, 35		
49		24			Order No. 580, 1931
50	47 (3)				
51					
52		21			
Provisions with respect to Buildings.					
53			27		
54		25			
55					Local Acts
56			25	20	
57			26		
58	160				Towns Improvements Clauses Act, 1847, ss. 75, 78 and Local Acts
59		36			Local Acts
60					Local Acts
Bye-laws with respect to Buildings.					
61	157	23	24		Housing & Town Planning Act, 1919, s. 24 Education Act, 1921, s. 166, Order No. 580 and Local Acts
62					
63					
64	158, part		16		
65	158, part				Order No. 580, 1931
66			15, pt		
67					
68					
69					Housing Act, 1925, s. 101
70					
71	157		33		
Removal of Refuse, Scavenging and Keeping of Animals.					
72	42, 43, 44	26 (2)			Local Acts
73			48		
74					
75					Local Acts
76	45				Order No. 580, 1931
77	42, 44				
78		27			Order No. 580, 1931
79	49				
80	50				
81	44				Order No. 580, 1931
82		26 (1)			Order No. 580, 1931

P.H.A. 1936.	P.H.A. 1875.	P.H.A. 1890.	P.H.A. 1907.	P.H.A. 1925.	Other Acts or Orders.
					Filthy or Verminous Premises or Articles and Verminous Persons.
83	46			46	Metro. Police Courts Act, 1839, s. 41
84			56	45	
85				48	Cleansing of Persons Act, 1897, ss. 1 & 2; Local Government Act, 1929 s. 1
86				49	
					Public Sanitary Conveniences.
87	39	20 (1)	47		Local Government Act, 1929, ss. 30, 31 & Sch. 1, and Order No. 580, 1931
88		20 (2) (3) (4)	43		
89			44		
					General.
90			23		